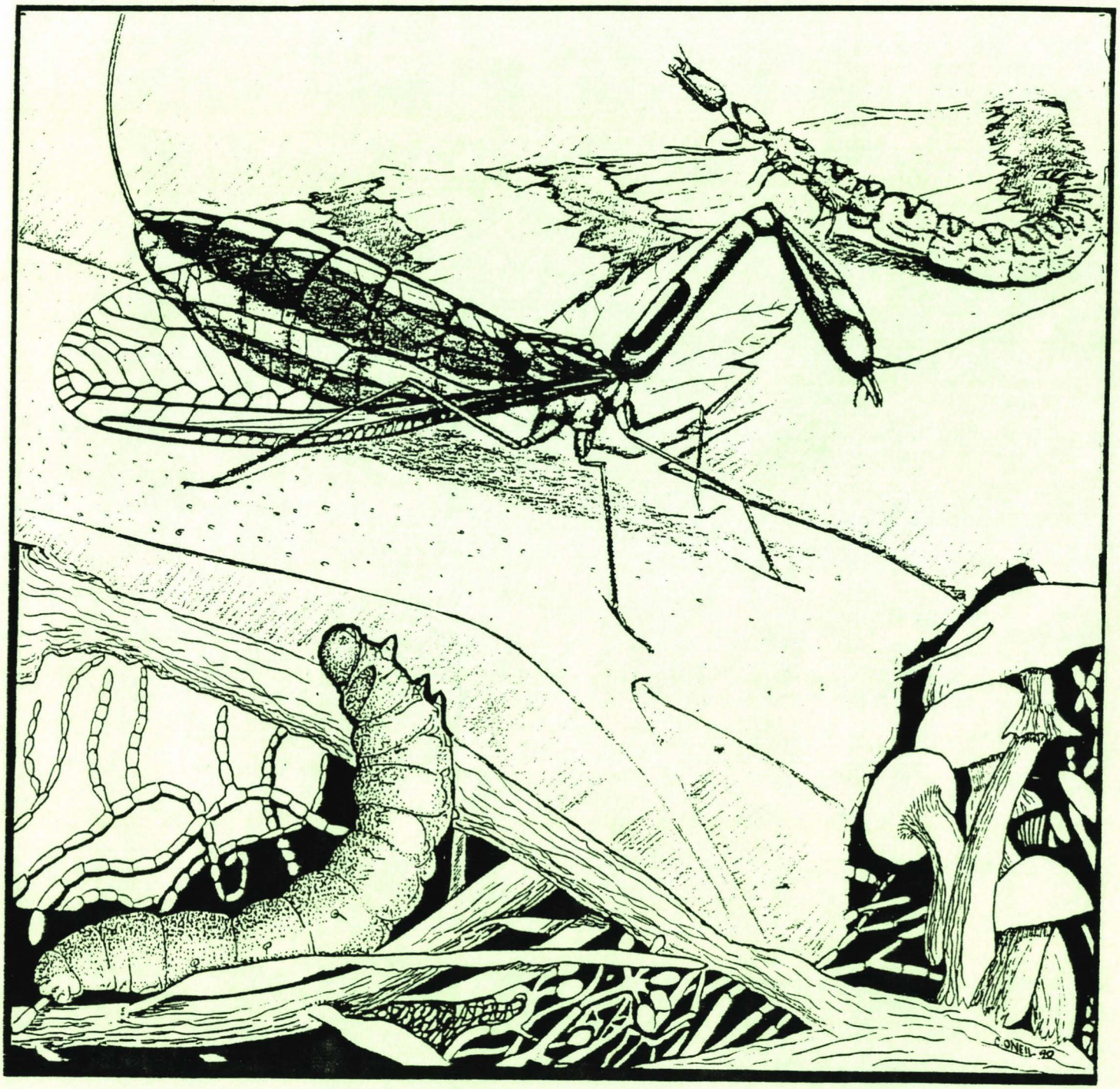
SB761
U7R63
1991

United States
Department of
Agriculture

Timber,
Forest Pest,
& Cooperative
Forestry
Management

Denver, Colorado

FOREST PEST CONDITIONS IN THE ROCKY MOUNTAIN REGION FOR 1991



FOREST PEST CONDITIONS

IN THE

ROCKY MOUNTAIN REGION

1991

By

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April 1993

Renewable Resources, Forest Health Management
Rocky Mountain Region
USDA Forest Service
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EXPERIMENT STATION

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ACKNOWLEDGEMENTS

The Forest Health Management (FHM) Staff of the Renewable Resources Unit extends appreciation to all cooperators who contributed to this report. The cover was designed by Curtis O'Neil.

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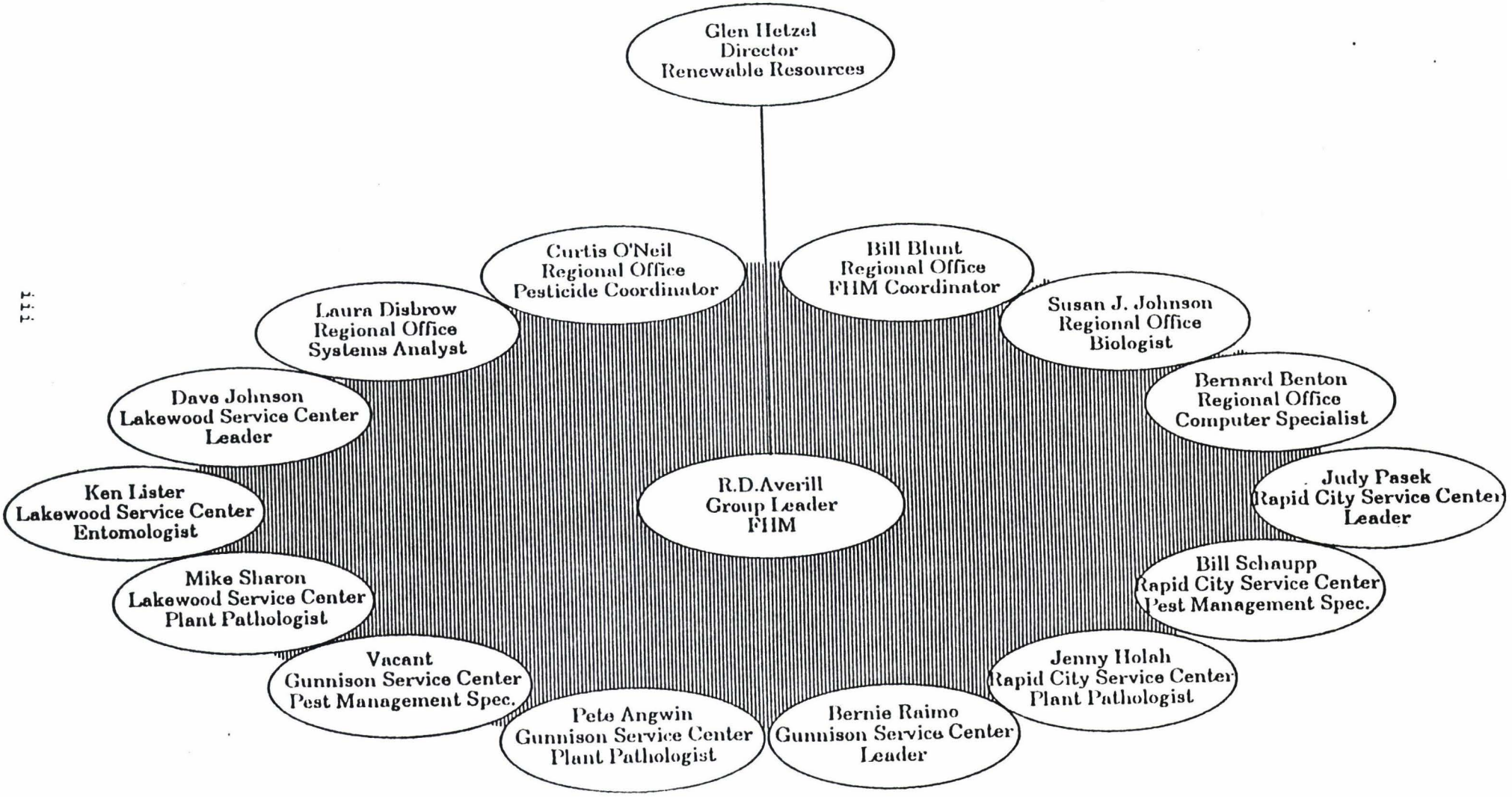
FOREST HEALTH MANAGEMENT ORGANIZATION

Rocky Mountain Region



INTRODUCTION

Forest Health Management (FHM) is responsible for the detection, evaluation and suppression of insects and diseases on forested Federal lands. FHM also administers financial and technical assistance programs with the State Foresters. In addition, the management of Gypsy Moth is a shared responsibility with the Animal Plant Health Inspection Service (APHIS). APHIS also has the responsibility for the range pest management programs on Federal lands. The close coordination and cooperation of the Federal and State Agencies responsible for pest management on all lands is a holistic effort.

FOREST HEALTH MANAGEMENT SERVICE CENTERS

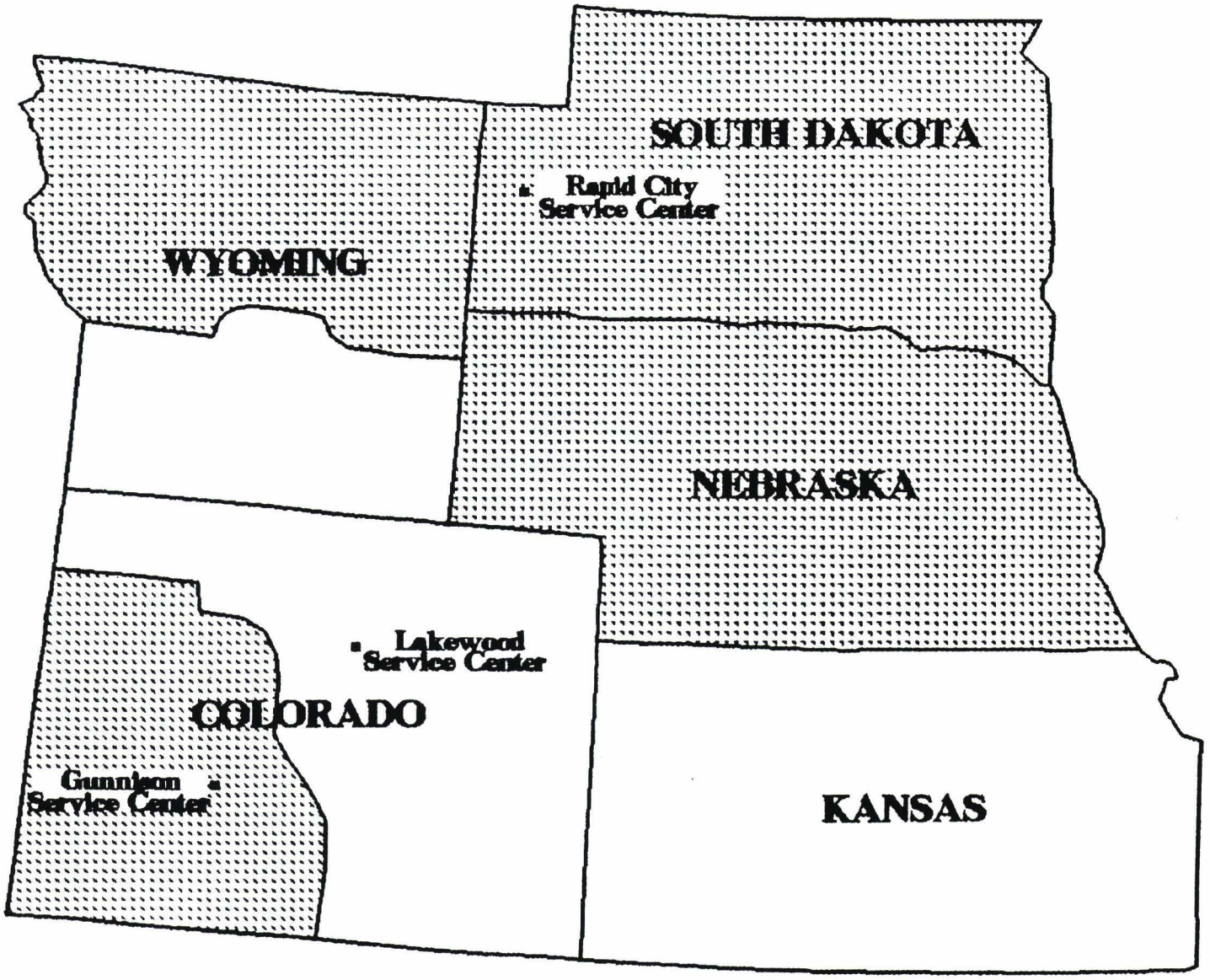
Three Service Centers serve the Rocky Mountain Region. The Lakewood Service Center in Building 20 on the Denver Federal Center provides assistance to Kansas, eastern and northwestern Colorado and southern Wyoming. Dave Johnson, Supervisory Plant Pathologist, serves as the Service Center Leader. Ken Lister and Mike Sharon are the Center's Entomologist and Plant Pathologist, respectively.

The Gunnison Service Center is located at 216 North Colorado, Gunnison, Colorado 81230. It provides assistance to the San Isabel, Rio Grande, Gunnison, and Uncompahgre National Forests and to cooperators west of the Continental Divide in Colorado. Bernie Raimo is Supervisory Entomologist and Service Center Leader and Pete Angwin is the Center's Plant Pathologist. An additional pest specialist will be added in Fiscal Year 1993.

The Rapid City Service Center is co-located with the Rocky Mountain Forest and Range Experiment Station at the Forestry Sciences Lab, South Dakota School of Mines and Technology. The Service Center provides assistance to cooperators east of the Continental Divide in northern Wyoming, and in South Dakota and Nebraska within Region 2. Judith Pasek is Supervisory Entomologist and Service Center Leader and Bill Schaupp is the Center's Pest Management Specialist. Jenny Holah will join as the new Plant Pathologist in 1992.

The three Service Centers were established to provide timely and effective pest management services to their customers. Questions concerning Center operations and requests for service can be directed to the Group Leader, FHM in the Regional Office or the respective Service Center Leaders.

ROCKY MOUNTAIN REGION
Forest Health Management Zones



FOREST HEALTH MANAGEMENT WORKSHOPS AND TRAINING

Tree Health Management Series

Ten workshops and two exhibits were held throughout the country. Over 330 people in the Forest Service and Department of Interior learned about risk, reason, and common sense in evaluating trees for hazard. The program was exhibited at the International Society of Arboriculture Conference in Philadelphia and the USDA Forest Service Recreation University in Denver. More than 800 people were introduced to the "Tree Health Management Hazard Tree Program." The video is now in ten countries outside North America. The recent additions are: Japan, Mexico and New Zealand. A session on evaluating trees for hazard was held in Nebraska City, Nebraska (July 10-11, 1991). The session was intended to sensitize, inform, and teach people who care for trees and are concerned with public safety. A total of 60 people attended. A two-day training session on Tree Health Management Evaluating Trees For Hazard" was given in Alamosa, Colorado, in August. Thirteen state and federal people attended.

Insect and Disease Recognition and Management

A poster (with video) on the Chapman Campground (White River National Forest) vegetation management project was presented at the Recreation University. A luncheon presentation on hazard tree recognition and management was presented to the Taylor River and Cebolla Districts of the Gunnison National Forest in May.

A two-day training session on insect and disease recognition and management in the Region was held in Sheridan, Wyoming (June 19 -20). Eighteen people attended the session. This session emphasized recognition, management and treatment of major forest pests in the Region.

INTERNATIONAL FORESTRY

Forest Health Management is collaborating with the International Institute of Biological Control (IIBC) to search out natural enemies of the Cypress aphid, *Cinara cupressi*, which is causing millions of dollars in losses in Kenya and other east African nations.

Forest Health Management personnel collected several Cinara species, including the Rocky Mountain juniper aphid (*Cinara sabinae*) which is thought to be synonymous to *Cinara cupressi*. A number of aphids were collected from Rocky Mountain juniper (*J. scopulorum*), one seed juniper (*J. monosperma*), and common juniper (*J. communis*). Many of the aphids were parasitized. Subsequently, the parasitoids were reared in the Lakewood Service Center Lab. The aphids and parasitoids collected in this Region so far are the most significant finds in the United States. The Region is committed to working with IIBC on this project through 1992.

Relatively little is known about rearing aphids and parasites for biological control programs in this Region, but there may be an opportunity to play a key role in supplying biological control agents for this international project.

INSECT AND DISEASE CONDITIONS IN BRIEF

In 1991, aerial surveys were conducted on the Black Hills and Bighorn National Forests in South Dakota and Wyoming. In Colorado, an aerial survey was conducted on the Uncompahgre National Forest. Data for acres affected by mountain pine beetle and western spruce budworm (Tables 1 and 2) were developed from these surveys together with ground reconnaissance.

TABLE 1. ESTIMATES OF DAMAGE CAUSED BY MOUNTAIN PINE BEETLE BASED ON AERIAL AND GROUND SURVEYS IN REGION 2.

State	1990 Acres Affected	1991 Acres Affected	1991 Volume[1] Killed	1991 Number Of Trees Killed
Colorado	9,710	----	---	1,400
South Dakota	6,720	10,879	602	33,271
Wyoming	8,200	11,000	68	3,745

[1]Volume in thousand cubic feet of timber

TABLE 2. ACRES OF AERIALLY-DETECTED DEFOLIATION CAUSED BY WESTERN SPRUCE BUDWORM IN REGION 2.

State	1990	1991
Colorado	52,000	509,000
Wyoming	8,100	27,151

INSECTS

Loss of ponderosa pine to the mountain pine beetle increased from 1990 in the Black Hills National Forest in South Dakota, while a ten-fold decrease in trees killed by this insect occurred on the Norwood District of the Uncompahgre National Forest in Colorado.

Defoliation by the western spruce budworm increased dramatically in 1991. The most significant increase was in the Gunnison Service Center area in Colorado where approximately 500,000 acres of mixed conifer and subalpine forest were defoliated. Pine sawfly outbreaks continued in ponderosa pine where populations increased in western South Dakota, central and western Nebraska. They declined in eastern Wyoming.

Gypsy moth detection trapping survey was conducted throughout the Region during 1991. Single moth catches were found at private campgrounds near Rockerville and Spearfish in the Blackhills of South Dakota and at a campground in Tensleep Canyon on the Bighorn National Forest in Wyoming. In Nebraska, single catches were detected at Lincoln, Beatrice, and in the Nebraska National Forest near Valentine. A Pennsylvania nursery shipped Colorado blue spruce trees that were infested with gypsy moth to a broker in South Dakota, who distributed them to an eleven-state area including nurseries and retail outlets in South Dakota, Kansas, and Nebraska. Numerous females and egg masses were found on stock received at 4 nurseries and distributed to about 40 outplanted sites in the Omaha, Nebraska area. An infested shipment containing egg masses and females was also detected at Fremont , Nebraska. Numerous trap catches of male moths were found at sites scattered throughout Omaha. These introductions in Nebraska will be monitored by APHIS and the state of Nebraska in 1992 to determine whether populations have become established and in need of eradication efforts. Moths were collected at six sites in Colorado.

DISEASE

Disease conditions were similar to or less severe in 1991 than 1990. Dwarf mistletoes continued to be the most damaging disease agents in the Region. Survey and suppression activities for lodgepole pine dwarf mistletoe have continued in Colorado and Wyoming. Presuppression surveys were conducted on 15,511 acres on nine National Forests.

Extensive disease surveys were conducted in the Bighorn Mountains and areas of the Black Hills, where little pathology work has been done in the past. Common diseases in the Bighorn National Forest include dwarf mistletoe, comandra blister rust, broom rust, western gall rust, and mortality of fir and spruce (causes unknown). Spruce mortality in the Black Hills was most frequently associated with Armillaria root disease, but also included factors such as thin, rocky soils and fluctuating water tables.

In 1991, Forest Health Management staff personnel continued surveys in aspen stands to determine whether site or stand parameters could be correlated with poor regeneration. They also assisted the Shoshone National Forest in developing vegetation management programs by conducting comprehensive forest pest surveys in eleven recreation sites along the corridor of the North Fork of the Shoshone River.

Canker diseases continue to plague windbreak and landscape trees throughout the Region. The increased incidence of some stress-related diseases, like Cytospora canker in Wyoming and Siberian elm canker in Nebraska, South Dakota, and Wyoming, is probably related to preceding years of drought. Siberian elm has been severely damaged by canker. The incidence of foliage diseases, vascular wilts and declines were no greater this year than the past two years.

URBAN AND SHELTERBELT TREE PROBLEMS

Fire blight: *Erwinia amylovora* (Burr.) Winsl. et al.

This disease caused considerable damage in Wyoming where there had been an unusually wet spring. It was reported to be severe around Colorado Springs in Colorado, and was widespread, but not unusually severe in South Dakota.

ABIOTIC DISEASES

Winter Damage

The effects of the February 1989 "Arctic Blast" storms on tree vigor and survival continued to be felt throughout Colorado in 1990. Red belt in approximately 300 acres of Douglas-fir and white fir along Cucharas Creek on the San Carlos District of the San Isabel National Forest is severely impacting the aesthetic quality of a section of the proposed "Highway of Legends" Scenic Byway between the town of Cuchara and Cucharas Pass. Winter drying damage in ponderosa pine, lodgepole pine and white fir, together with high levels of white trunk rot (*Phellinus tremulae*) and sooty bark canker (*Cenangium singulare*) in aspen, influenced a decision by the San Carlos District to not build a 35-unit campground in the area above Spring Creek Picnic Ground.

An area along the Colorado Front Range was examined in detail by scientists from the Rocky Mountain Forest and Range Experiment Station. They found mortality of affected lodgepole pine to be less than one percent. New growth is expected to mask affected trees in one to two years.

Winter drying is a widespread and continuing problem with a large variety of tree species. The condition was especially severe in southeastern Wyoming during 1990. In Nebraska and South Dakota, however, the problem was not as severe as previously reported.

Drought

The long term and secondary effects of the previous dry period are appearing in trees. Normal or near normal precipitation was experienced throughout most of the Region during 1991. The increased incidence of some stress-related diseases, like Cytospora canker in Wyoming and Siberian elm canker, is probably related to preceding drought conditions.

Chemical Damage

Herbicide damage, caused by aerial applications to croplands, continued to be the most commonly reported tree disorder in South Dakota and Wyoming. It was noted to be a continuing problem in Colorado. In Kansas, however, the incidence was less than normal.

Animal Damage

Severe damage associated with porcupine feeding occurred on ponderosa pine in the Black Hills National Forest. Similarly, squirrels caused significant damage to hackberry, honeylocust and elm throughout South Dakota.

NURSERY DISEASE PROBLEMS AND STUDIES

Soil solar heating and fumigation with MC-33 (67% methyl bromide and 33% chloropicrin) and Basamid (granular dazomet) were compared as pre-sowing soil treatments for fall-sown eastern redcedar. Results indicated that for survival of eastern redcedar, Basamid (with water seal) was as good and perhaps better than fumigation with MC-33. Poor survival in spots with the MC-33 treatment probably resulted from clogged injectors. Survival in the Basamid area was consistently good, except for the edge that bordered the solar treatment. Survival was poorest in the solar heated area.

INSECTS AND DISEASES THAT AFFECT DOUGLAS-FIR COVER TYPE

Western spruce budworm: *Choristoneura occidentalis* Freeman

In Colorado, the area infested by the western spruce budworm is estimated to be 509,000 acres. Moderate to heavy defoliation occurred on the San Juan, San Isabel, Rio Grande, Gunnison, White River, and Pike National Forests. The outbreaks in these areas are expected to increase in 1992. In Wyoming, heavy defoliation continued on about 6,500 acres on Bureau of Land Management land southwest of Buffalo, and moderate defoliation occurred on about 10,000 acres in Sunlight Basin on the Shoshone National Forest.

Douglas-fir beetle: *Dendroctonus pseudotsugae* Hopkins

The Douglas-fir beetle continues to occur in Colorado. Mortality is generally decreasing and is widely scattered. It continues to occur in mixed conifer stands damaged during the spruce budworm outbreak of the late 70's and early 80's. The infestation along the Colorado Front Range has been underway since 1982. The infestation level generally exhibits a decline with a few areas showing static to increasing trends.

On the Shoshone National Forest in northwestern Wyoming, the Douglas-fir beetle outbreak continues to build in green trees. Populations built up in fire-killed Douglas-fir following the 1988 Clover Mist Fire. A biological evaluation conducted in fall 1990 predicted potential for significant increases in the population in 1991. However, brood mortality of about 75-80 percent occurred over winter due to extreme cold temperatures, subsequently about the same number of trees were infested in 1991 as in 1990. Spots of infestation continue at Sugarloaf Mountain, Camp Creek, Upper-Reef Creek, Cathedral Cliffs, Squaw Creek, Russell Peak, and Pahaska Tepee. Some spread across the Clarks Fork River east of Sugarloaf Mountain in Sunlight Basin was noted. Sanitation harvesting at Cathedral Cliffs removed about 2,000 infested trees in 1990, and another 2,000 in 1991.

Pheromone baits were used to concentrate beetles in logging decks and adjacent trees for removal in 1991. Sanitation operations conducted at Camp Creek in 1990 appear to have mitigated the infestation in that local area with the exception of one small spot. A biological evaluation conducted in the fall of 1991 on the Clarks Fork Ranger District indicates a decline in brood numbers since the fall of 1990.

Douglas-fir dwarf mistletoe is common throughout much of the Douglas-fir type in Colorado and western Wyoming. Because of the lack of intensive management of this tree species, very little emphasis is placed on control of the disease. As more intensive management of developed recreation site occurs, it is anticipated that control measures will also increase in infested areas.

INSECTS AND DISEASES THAT AFFECT THE PONDEROSA PINE COVER TYPE

Mountain pine beetle: *Dendroctonus ponderosae* Hopkins

There are three mountain pine beetle infestation areas causing management concern in the Region. The three areas are:(1) in the Black Hills National Forest at the southern end of the Harney Ranger District; (2) on the Uncompahgre National Forest at the north end of the Norwood Ranger District (Uncompahgre Plateau); and (3) on the Medicine Bow National Forest on the Douglas Ranger District (Cottonwood/Esterbrook Area).

The infestation in the Black Hills is being managed through tree harvest with timber sales; however, the magnitude of the population and the implementation time necessary for such a project allow further spread. The infestation on the Uncompahgre Plateau is finally showing signs of a decline. Continued thinning of dense stands will help to reduce the threat of additional losses which have persisted for at least 13 years. Considerable effort has gone into slowing the outbreak. Salvage cutting, direct control of beetles in infested trees, and preventive thinning to provide host density regulation have been utilized.

Small evaluation tests utilizing the technique of "Spray & Bait" were installed on the Uncompahgre Plateau in 1990 and on Medicine Bow NF in 1991. Ten paired plots were used. On one plot, all ponderosa pine over 8 inches dbh were sprayed with carbaryl and the other plot received no spray. The two center trees in each plot pair were baited with MPB Tree Baits. Paired plot statistical analysis was done to compare plot attributes (basal area, average diameter, and stems per acre by diameter class) to determine if there were significant differences between plots relative to MPB susceptibility. In both tests, post beetle flight, preliminary data clearly indicate that the combination of spraying and baiting trees can be a viable tool for managing mountain pine beetle. Test plots will be visited in 1992 for more conclusive results.

In 1989, at the Cottonwood-Esterbrook Project area, a decrease in brood density and attack ratio occurred probably due to severe cold weather in December 1988. This population has now returned to an increasing trend. Project suppression consists mostly of spot treatments of salvage logging on private lands, limited direct control of beetles in infested trees, and protective spray for high value trees near cabins and homesites. On federal lands (United States Forest Service and Bureau of Land Management) and on Wyoming state lands, timber sales are planned to salvage infested trees and thin stands to prevent additional losses.

Pine engraver beetles: *Ips* species

Several drought years appear to have favored population increases and *Ips* populations continued to cause scattered mortality throughout the Black Hills. Populations are expected to decline as trees recover from the effects of the drought, dependent upon spring precipitation.

Root Diseases: *Armillaria* sp. and *Heterobasidion annosum*

Armillaria root disease is the most common root disease in Region 2. The disease is affecting management of mixed conifer stands on the Southern Ute Reservation and is present in the spruce/fir stands at the North Cone and Truby Complex Timber Sale areas on the Uncompahgre and San Juan National Forests. *Armillaria* was also noted in pinyon pine along Interstate Highway 50 near Maysville, Colorado, on the east side of Monarch pass.

In 1991, harvest activities commenced on East Archuleta Mesa, Southern Ute Reservation. In addition to the routine harvest activities, treatment blocks were installed to test the effects of various harvest methods (uneven-aged management, single tree selection; sanitation/salvage; stump removal and no treatment) on the spread of Armillaria and annosus root disease. Planting trials were also established in stump and non-stumped areas to test the tolerance of 6 tree species to *Armillaria sp* and *Heterobasidion annosum*. Planting of the seedlings into the stumped and non-stumped test blocks is scheduled for 1992. The Rocky Mountain Forest and Range Experiment Station, in cooperation with the CSU Department of Plant Pathology, initiated the study to examine the correlation between below and above ground indicators of root disease. After assessing the above-ground condition of 10 ponderosa pine , 36 white fir and 36 Douglas-fir , the root systems were excavated, examined and assessed for percent non-functionality due to root disease. Data from the study are currently being analyzed.

Region 2 Forest Health Management, in cooperation with the Southern Ute Agency, installed permanent plots in 6 mixed conifer stands (4 with high levels of root disease, 2 with low levels) to track the spread of Armillaria and annosus root disease. The results will be used to help validate/calibrate the recently developed western root disease computer simulation model.

Evaluation of field tests of the plant growth regulator, ethephon, has shown that significant abscission of ponderosa pine dwarf mistletoe shoots occurs within a few weeks after application. Tests conducted in the Black Forest north of Colorado Springs, Colorado, in 1988, on ponderosa pine dwarf mistletoe showed abscission rates of 73 to 98 percent with mid-June , mid-July, and mid-August applications of the chemical at rates of 2200 and 2700 ppm ethephon in water with a spreader-sticker.

Examination of trees three years following treatment showed some development of immature shoots on all treatments, but insignificant numbers of mature shoots with fruits on all infections including controls (non-chemically treated trees). The reduction in numbers of infections with shoots observed in the controls is attributed to a number of natural control agents including, drought, branch mortality and insects. Observations are planned for several more years to determine when mature shoots will develop on ethephon-treated trees.

INSECTS AND DISEASES THAT AFFECT THE LODGEPOLE PINE COVER TYPE

Mountain pine beetle: *Dendroctonus ponderosae* Hopkins

Mountain pine beetle populations are very low throughout the Region in the lodgepole pine type. A small infestation persists near Ute Pass on the Dillon Ranger District of the Arapaho National Forest. Suppression is being attempted by using baited funnel traps and baits to contain the spread. An intensive survey is planned in 1992 to evaluate the infestations.

Lodgepole pine dwarf mistletoe: *Arceuthobium americanum* Nutt. ex Engelmann

Approximately 50 percent of the lodgepole pine type is infested with dwarf mistletoe in Colorado and Wyoming. Annual losses on National Forest system lands in Colorado and Wyoming are estimated at more than 10 million cubic feet. Presuppression surveys were conducted on 12,697 acres on four National Forests and cultural control was conducted on 2,814 acres on five National Forests.

Vegetation Management in Developed Recreation Areas--Forest health in developed recreation areas continues to be an ongoing concern in Region 2. In 1991, progress on vegetation management projects that were developed in past years was continued, while several new ones were initiated.

In July 1991, intensive surveys were conducted in two campgrounds (Parry Peak and Twin Peaks) near the Twin Lakes area of the San Isabel National Forest. The surveys provided an estimation of the extent, distribution, and severity of lodgepole pine dwarf mistletoe, root disease, canker and hazard tree problems, both within and immediately outside the campgrounds. Lodgepole pine dwarf mistletoe was the major management problem found in the Twin Lakes campgrounds. Marking and removal of many of the mistletoe-infected trees began in October 1991. An aggressive planting effort aimed at increasing age and species diversity in the campgrounds is planned for 1992.

In August 1991, walk-through evaluations of forest health were performed in four campgrounds on the Ouray District of the Uncompahgre National Forest. The walk-through evaluation was followed up by an intensive survey in the white fir stands of Amphitheater Campground. This information will be incorporated into a vegetation management plan in the future.

INSECTS AND DISEASES THAT AFFECT SPRUCE-FIR COVER TYPE

Spruce beetle: *Dendroctonus rufipennis* (Kirby)

Spruce beetle is endemic in the Region; there are no known outbreaks in standing trees. Some small populations occur in areas of logging operations, road right-of-way clearings, and windthrown spruce stands. Timely removal of infested material was recommended at several sites.

Root Diseases: *Armillaria sp.* and *Heterobasidion annosum*

Armillaria and annosus root disease were reported as management concerns in spruce/fir stands at the North Cone and Truby Complex Sale areas on the Uncompahgre and San Juan National Forests. In both areas, subalpine fir were affected to a greater degree than the more disease-tolerant spruce. Currently,an uneven-aged prescription is proposed and recommended.

Black Hills (White) Spruce type: Armillaria root disease on spruce in the Black Hills of South Dakota -- During a tree disease survey of the Black Hills in 1990, widespread mortality of Black Hills spruce was noted, but the causes were not determined. In 1991, an examination of dead spruce trees was conducted to better determine probable causes of mortality. Armillaria root disease, bark beetles, thin, rocky soils and fluctuating water tables were associated with the dead spruce trees. Armillaria root disease was the most common of these factors and is probably the major cause of spruce dying in the Black Hills. This disease was found in 86 percent of the stands examined.

INSECTS AND DISEASES THAT AFFECT THE ASPEN COVER TYPE

Aspen Regeneration Failure Studies: Soil Characteristics -- For the last two years, Forest Health Management personnel have been involved with a cooperative project to study the factors involved in aspen regeneration failure. This is aimed at developing a better means to predict when and where such failures are likely to occur. Cooperators in the project include Colorado State University Department of Plant Pathology and Weed Science, Forest Health Management, Rocky Mountain Forest and Range Experiment Station, Soil Conservation Service, and various Ranger Districts on the Grand Mesa, Uncompahgre, Gunnison, San Juan, and Routt National Forests.

During the 1990 and 1991 seasons, eight pairs of plots were installed and monitored to determine differences in soil and moisture characteristics on sites where aspen regeneration has failed as well as those where it has succeeded. Detailed descriptions of the soils at four and a half of the eight paired plots have also been completed. Preliminary examination of the data revealed no dramatic differences between soil and soil moisture conditions that might explain the regeneration failures. Complete analysis of the data is forthcoming. More measurements in 1992 will concentrate on early spring and late summer months when maximum inter-plot differences in soil moisture is expected to occur.

Aspen Regeneration Failure Studies: Fire and Herbivery -- In 1991, a new cooperative study was initiated to investigate the effects of herbivore pressure and fire-stimulation of sprouting on post-harvest aspen regeneration. Participants include the Ouray Ranger District on the Uncompahgre National Forest, Gunnison Service Center Forest Health Management, and Rocky Mountain Forest and Range Experiment Station. The Monitor Mesa aspen sale area of the Ouray District was chosen as the site for the study. Pre-harvest vegetation surveys have already been completed. Following the harvest, half of the sale area will be broadcast burned. Exclosures will then be installed on portions of each half to exclude elk/deer and livestock. Heights and numbers of aspen suckers in the treatment areas will be monitored annually for five years following the burn.

Rocky Mountain Region Insects

Prepared by Curtis O'Neil

Insect	Host	Location	Remarks
A willow sawfly *Nematus sp.*	Willow	Wyoming	No significant activity was reported in 1991.
Ash plant bug *Tropidosteptes amoenus*	Green ash	South Dakota	No significant activity was reported in 1991.
Aspen leaf beetle *Chrysomela crotchi*	Aspen	South Dakota	Defoliation was abundant in the central and southern Black Hills
Balsam twig aphid *Mindarus abietinus*	Balsam fir	South Dakota	No significant activity was reported in 1991.
Birch skeletonizer *Bucculatrix canadensisella*	Birch	South Dakota	Defoliation was moderate in the central and southern Black Hills.
Blackheaded ash sawfly *Tethida cordiger*	Green ash	South Dakota	No significant activity was reported in 1991.
Bronze birch borer *Agrilus anxius*	Paper birch	South Dakota	No significant activity was reported in 1991.
Cankerworms *Alsophila pometaria* *Paleacrita vernata*	Boxelder, Hackberry, Honeylocust, Siberian elm	Kansas, South Dakota	Damage occurred in southeastern Kansas on hackberry and elm trees; elsewhere, damage was low. Fall cankerworm caused 80 percent defoliation on 80 acres in Dewey County, South Dakota.
Common falsepit scale *Lecanodiaspis prosopidis*	Green ash, Hackberry, Red mulberry	Colorado	No significant activity was reported in 1991.
Cottonwood borer *Plectrodera scalator*	Cottonwood	South Dakota	No significant activity was reported in 1991.

Rocky Mountain Region--Status of insects in Colorado, Kansas, Nebraska, South Dakota, and central and eastern Wyoming.

Insect	Host	Location	Remarks
Dioryctria moths *Dioryctria ponderosae* *D. tumicolella* *Dioryctria* sp.	Austrian pine, Pinyon pine, Ponderosa pine, Scots pine	Colorado, Nebraska, South Dakota	This pest continued to be a serious problem throughout most of Nebraska and South Dakota. *Dioryctria* sp., in conjunction with twig beetles, are causing pinyon mortality and branch dieback in southern Colorado.
Douglas-fir beetle *Dendroctonus pseudotsugae*	Douglas-fir	Colorado, Wyoming	On the Shoshone National Forest in Wyoming, beetles spread from trees blackened by the 1988 Clover Mist Fire to nearby scorched and green trees. About 2,500 trees were infested in 1991 at Sugarloaf Mountain, Camp Creek, Upper-Reef Creek, Cathedral Cliffs, Squaw Creek, Russell Peak, and Pahaska Tepee. The epidemic is expected to increase in 1992. Douglas-fir beetle is generally decreasing in Colorado, but scattered infestation spots still occur along the Colorado Front Range.
Elm calligrapha *Calligrapha scalaris*	Siberian elm	South Dakota	No significant activity was reported in 1991.
Elm leaf beetle *Pyrrhalta luteola*	American elm, Siberian elm	Kansas, Nebraska, South Dakota	Several windbreaks in western Kansas were severely damaged, but populations were normal throughout the rest of the state. Moderate defoliation occurred throughout most of Nebraska and South Dakota. Severe defoliation occurred in Yankton, South Dakota.
European pine sawfly *Neodiprion sertifer*	Pine	Kansas	No significant activity was reported in 1991.
Fall webworm *Hyphantria cunea*	Cottonwood, Wild plum	Colorado Wyoming	In Colorado, drainages on the Front Range were infested. Scattered pockets occurred on the Medicine Bow National Forest in Wyoming,
Flea beetle *Altica* sp.	Cottonwood	Colorado	Moderate defoliation occurred along the Gunnison River west of Gunnison.

Rocky Mountain Region--Status of insects in Colorado, Kansas, Nebraska, South Dakota, and central and eastern Wyoming.

Insect	Host	Location	Remarks
Gypsy moth *Lymantria dispar*	Hardwoods	Colorado, Nebraska, South Dakota, Wyoming	In Nebraska, infested stock shipped from Pennsylvania was distributed to sites around Omaha and Fremont, Nebraska. Single moth catches occurred in traps at Lincoln, Beatrice, and the Nebraska National Forest near Valentine. In South Dakota, single moth catches occurred in survey traps in campgrounds near Spearfish and in Rockerville. No moths were detected in delimitation traps in Keystone and west of Custer, South Dakota. In Wyoming, a moth was caught in a survey trap in Tensleep Canyon on the Bighorn National Forest. No moths were caught in Colorado.
Hackberry galls *Pachypsylla celtidismamma* *P. celtidisversicula*	Hackberry	South Dakota	No significant activity was reported in 1991.
Honeysuckle aphid *Hyadaphis tataricae*	Honeysuckle	South Dakota	Damage continued statewide.
Lilac borer *Podosesia syringae*	Green ash, Lilac	Nebraska, South Dakota	No significant activity was reported in 1991.
Mountain pine beetle *Dendroctonus ponderosae*	Limber pine, Lodgepole pine, Ponderosa pine	Colorado, South Dakota, Wyoming	Mountain pine beetle in ponderosa pine continued to be the most severe pest in Region 2. In lodgepole pine, mountain pine beetle was endemic. In Colorado, an outbreak on the Uncompahgre Plateau decreased in 1991, but remains a problem. About 1,400 trees were reported killed during aerial surveys. In South Dakota, tree mortality increased significantly in the Black Hills. Nearly 11,000 acres were infested, accounting for 33,000 killed trees. In Wyoming, mortality of limber pine was apparent in Tensleep Canyon on the Bighorn National Forest. An outbreak continued in the northern Medicine Bow National Forest at Laramie Peak. The infestation increased in 1990,but was static in 1991. The infested area is about 11,000 acres.
Pandora moth *Coloradia pandora*	Ponderosa pine	South Dakota	Adults were abundant in Custer, South Dakota, having developed from a small outbreak first detected in the southern Black Hills in 1989.

Rocky Mountain Region--Status of insects in Colorado, Kansas, Nebraska, South Dakota, and central and eastern Wyoming.

Insect	Host	Location	Remarks
Pine engraver beetle *Ips pini*	Jack pine, Lodgepole pine, Ponderosa pine	Colorado, Nebraska, South Dakota, Wyoming	Infestations continued to be abundant in ponderosa pine throughout most of the Black Hills in South Dakota and Wyoming. Beetle activity in lodgepole pine was detected in fresh blowdown material that resulted from a spring microburst windstorm on the Bighorn National Forest.
Pine sawfly *Neodiprion autumnalis*	Ponderosa pine	South Dakota, Wyoming	Outbreaks continued for the second and third year in some areas of South Dakota and Wyoming. Heavy defoliation was detected between Spearfish and Belle Fourche and other outlying towns on the east edge of the Black Hills. In Wyoming, populations southeast of Gillette collapsed in 1991, but defoliation north of Gillette was heavy.
Pine tip moths *Rhyacionia bushnelli*	Austrian pine, Pinyon pine, Ponderosa pine, Scots pine	Colorado, Kansas, Nebraska, South Dakota	Damage was light on Christmas tree plantations and nurseries. Young pines in windbreak and landscape plantings continued to be damaged throughout the plains and in metro areas of Colorado. Pine regeneration in the central and southern Black Hills of South Dakota was heavily damaged.
Pinyon pitch-nodule moth *Retinia arizonensis*	Pinyon pine	Colorado	No significant activity was reported in 1991.
Red turpentine beetle *Dendroctonus valens*	Ponderosa pine	South Dakota	Populations were heavy in standing stumps resulting from tornado damage in the southern Black Hills and in timber sale areas in northeastern Black Hills. Little tree mortality expected.
Roundheaded pine beetle *Dendroctonus adjunctus*	Ponderosa pine	Colorado	Populations continued on the Uncompahgre Plateau in conjunction with mountain pine beetle and western pine beetle.
Spruce beetle *Dendroctonus rufipennis*	Engelmann spruce	Colorado, Wyoming	No reports of problems in Colorado. A few areas of spruce blowdown and timber sales were monitored for activity. In Wyoming, low population levels were present near burned and wind thrown areas.

Rocky Mountain Region--Status of insects in Colorado, Kansas, Nebraska, South Dakota, and central and eastern Wyoming.

Insect	Host	Location	Remarks
Tent caterpillars *Malacosoma americanum* *M. californicum* *M. disstria*	Chokecherry, Hardwoods, American plum	South Dakota	Defoliation was heavy in wooded draws in the Black Hills of South Dakota and Wyoming.
Twig beetles *Pityophthorus* sp.	Pinyon pine	Colorado	Twig beetles in association with dioryctria moths are causing mortality and branch dieback in southern Colorado.
Uglynest caterpillar *Archips cerasivorana*	Chokecherry	South Dakota	No significant activity was reported in 1991.
Walnut caterpillar *Datana integerrima*	Pecan, Walnut	Kansas	Defoliation damage continued in the eastern part of the state; 1990 defoliation was the worst on record.
Western pine beetle *Dendroctonus brevicomis*	Ponderosa pine	Colorado	Some populations of western pine beetle are still associated with roundheaded pine beetle and the mountain pine beetle outbreak on the Uncompahgre Plateau.
Western spruce budworm *Choristoneura occidentalis*	Douglas-fir, Engelmann spruce, Subalpine fir, White fir	Colorado, Wyoming	In Colorado, budworm acreage is estimated at 509,000 acres. Moderate to heavy defoliation occurred on the San Isabel, Rio Grande, Gunnison, White River, and Pike National Forests. These outbreaks are expected to continue in 1992. In Wyoming, heavy defoliation continued on 6,500 acres of Bureau of Land Management lands southwest of Buffalo, and light to moderate defoliation reappeared on 10,000 acres in the Sunlight Basin on the Shoshone National Forest.
White pine weevil *Pissodes strobi*	Colorado blue spruce	Colorado	White pine weevil damage to spruce leaders continued at a static level in south and central Colorado.

Rocky Mountain Region--Status of insects in Colorado, Kansas, Nebraska, South Dakota, and central and eastern Wyoming.

Rocky Mountain Region Diseases

Prepared by Curtis O'Neil

Disease	Host	Location	Remarks
Stem and Branch Diseases			
Ash heartrot *Perenniporia fraxinophola*	Green ash	South Dakota	Becoming more common in campgrounds and declining woody draws that are being grazed.
Black knot *Apiosporina morbosum*	Chokecherry	South Dakota	Numerous shelterbelt plantings in north-central South Dakota are badly infected.
Comandra blister rust *Cronartium comandrae*	Lodgepole pine	Colorado, Wyoming	Continues as one of the major diseases on the Shoshone and Medicine Bow National Forests, Wyoming. The disease is present in northern Colorado and western South Dakota but causes no significant damage.
Dwarf mistletoes *Arceuthobium americanum*	Lodgepole pine	Colorado, Wyoming	Dwarf mistletoes cause the greatest disease losses in Region 2. Losses equal at least 10 million cubic feet annually. In Colorado, 50 percent of the lodgepole pine type is infected. Forest Health Management funded presuppression surveys on 12,697 acres on four National Forests and silvicultural control on 2,814 acres on five National Forests.
Arceuthobium douglasii	Douglas-fir	Colorado	Occurs mostly in the southern two-thirds of the state. No suppression projects were funded by Forest Pest Management in 1991.
Arceuthobium vaginatum subsp. *cryptopodum*	Ponderosa pine	Colorado	Losses amount to 885,000 cubic feet annually. Caused light to severe problems in the Southern Ute Reservation and was a factor affecting management on the Uncompahgre National Forest.
Arceuthobium divaricatum	Pinyon pine	Colorado	A minor problem in western Colorado.

Rocky Mountain Region--Status of diseases in Colorado, Kansas, Nebraska, South Dakota, and central and eastern Wyoming.

Disease	Host	Location	Remarks
Poplar shoot blight *Venturia macularis*	Cottonwood	South Dakota	Several shelterbelts were infected.
Western gall rust *Endocronartium harknessii*	Lodgepole pine, Ponderosa pine	Colorado, Nebraska, South Dakota	Widespread throughout Region 2. Mostly low to moderate incidence, but heavy in some spots.
White pine blister rust *Cronartium ribicola*	Limber pine	Wyoming, South Dakota	Moderately severe outbreak occurred on the Bighorn National Forest. It was reported for the first time in South Dakota.

Canker Diseases

Botryodiplodia sp.	Juniper	Kansas	No significant activity was reported in 1991.
Botryosphaeria stevensii	Eastern redcedar, Rocky Mountain juniper	Kansas, Nebraska	No significant activity was reported in 1991.
Cytospora canker *Cytospora* spp.	Aspen, Birch, Cherry, Colorado blue spruce, Lilac, Mountain ash, Rose, Russian olive	Colorado, Kansas, Nebraska, South Dakota, Wyoming	Reported on blue spruce in windbreaks and landscape plantings throughout the Region. Common and damaging on hardwoods in Wyoming and South Dakota. Common on aspen throughout Colorado, where it is a management concern in campgrounds on the San Isabel National Forest.
Russian olive canker *Phomopsis* sp., *Tubercularia* sp. or *Lasiodiplodia* sp.	Russian olive	Kansas, Nebraska, South Dakota, Wyoming	Diseases caused by these fungi were especially severe in South Dakota and eastern Kansas during 1990. In other states, its status was not noted to be different than in previous years.
Siberian elm canker *Botryodiplodia hypodermia* *Tubercularia ulmea*	Siberian elm	Colorado, Nebraska, South Dakota, Wyoming	Elm decline continued to be severe in eastern Wyoming; northern, western, and southwestern Nebraska; and southern and western South Dakota.

Rocky Mountain Region--Status of diseases in Colorado, Kansas, Nebraska, South Dakota, and central and eastern Wyoming.

Disease	Host	Location	Remarks
Thyronectria canker *Thyronectria austro-americana*	Honeylocust	Colorado, Kansas, Nebraska, South Dakota, Wyoming	Widespread in windbreaks and landscape trees. In South Dakota, the disease was especially severe in the town of Hot Springs. In Kansas, about 100 acres of windbreaks were affected in the western part of the state. In Nebraska, it occurred throughout the state, but was not considered threatening.
Root Diseases			
Annosus root disease *Heterobasidion annosum*	Ponderosa pine, White fir	Colorado, Nebraska	Permanent plots were installed in mixed conifer stands on the Southern Ute Indian Reservation to monitor the disease, where it has an impact on management of stands. Reported on the San Juan National Forest also.
Armillaria root disease *Armillaria* spp.	Engelmann spruce, Lodgepole pine, Ponderosa pine, Subalpine fir	Colorado, South Dakota, Wyoming	In South Dakota, several new disease sites were found in the Black Hills National Forest; permanent plots were installed to monitor the disease's activity. Widespread mortality to Black Hills spruce occurred. The most common root disease in Colorado, it affected management of mixed conifer stands on the Southern Ute Indian Reservation. The disease was also noted on pinyon pine in southcentral Colorado.
Black stain root disease *Ophiostoma wageneri* (=*Ceratocystis wageneri*)	Pinyon pine, Ponderosa pine	Colorado	Continues to occur on ponderosa pine in interior portions of Colorado and on pinyon pine in the southwestern corner of the state.
Foliage Diseases			
Anthracnose *Gnomonia leptostyla*	Walnut	Kansas	No significant activity was reported in 1991.
Apiognomonia veneta (=*Gnomonia platani*)	Sycamore	Colorado, Kansas, Wyoming	Severe in Kansas, 100 acres were affected in the northern part of the state. Widespread in Nebraska, but not unusually severe. In Colorado, it was reported at locations in the southeastern and southwestern parts of the state.

Rocky Mountain Region--Status of diseases in Colorado, Kansas, Nebraska, South Dakota, and central and eastern Wyoming.

Disease	Host	Location	Remarks
Ash rust *Puccinia sparganioides*	Green ash	Kansas, Nebraska, South Dakota	No significant activity was reported in 1991.
Brown spot needle blight *Scirrhia acicola*	Scots pine	Kansas, Nebraska	No significant activity was reported in 1991.
Cedar apple rust *Gymnosporangium juniperi-virginianae*	Apple species, Eastern redcedar	Colorado, Kansas, Nebraska, South Dakota, Wyoming	Occasional occurrence in Kansas and Wyoming. Widespread in Nebraska, especially in the eastern part of the state, but intensity during 1991 remained low. In South Dakota, apple leaves were severely spotted, but the incidence of galls on cedar was much less than 1989.
Cercospora blight of juniper *Cercospora sequoiae*	Eastern redcedar, Rocky Mountain juniper	Nebraska, South Dakota	The disease remains one of the major concerns in windbreaks in Nebraska. In South Dakota, the disease was occasionally found in windbreaks, but it was not unusually severe except on a few shelterbelts in the south central area.
Diplodia blight *Sphaeropsis sapinea* (=*Diplodia pinea*)	Austrian pine, Ponderosa pine	Kansas, Nebraska, South Dakota,	Damage increased in Kansas, especially in urban and recreation plantings, where 300 acres were affected. In Nebraska and South Dakota, blight was less severe than usual.
Dothistroma needle blight *Scirrhia pini*	Austrian pine	Nebraska	Continues as a problem in Christmas tree plantations and windbreaks.
Fire blight *Erwinia amylovora*	Apple species, Cotoneaster, Crabapple	Colorado, South Dakota, Wyoming	Damage was somewhat lighter throughout the Region in 1991 than 1990.
Leaf shothole *Cylindrosporium* sp.	Black cherry, Chokecherry	Nebraska, South Dakota	This disease was severe in Bessey Nursery in Nebraska and Big Sioux Nursery in South Dakota.
Marssonina blight *Marssonina populi* *Ciborinia whetzelli*	Aspen	Colorado, South Dakota, Wyoming	In South Dakota, extremely heavy on susceptible varieties in shelterbelts and nurseries. In Wyoming and Colorado, low to moderate severity.
Melampsora leaf rust *Melampsora* spp.	Aspen	South Dakota	Foliage discoloration was in scattered pockets throughout the Black Hills in late summer.

Rocky Mountain Region--Status of diseases in Colorado, Kansas, Nebraska, South Dakota, and central and eastern Wyoming.

Disease	Host	Location	Remarks
Needle casts *Lophodermella concolor* *Lophodermella montivaga*	Lodgepole pine	Colorado	No significant activity was reported in 1991.
Septoria leaf spot *Septoria caraganae*	Caragana	South Dakota	Numerous shelterbelts throughout the state were defoliated in late summer. Little long-term effect is expected.
Vascular Wilts and Declines			
Ash decline	Green ash	Colorado	Mostly in urban areas. First recognized three years ago. Cause unknown.
Dutch elm disease *Ceratocystis ulmi*	Elm species	Colorado, Kansas, Nebraska, South Dakota, Wyoming	Regionwide. In Kansas and Nebraska, the disease is a continuing problem. In South Dakota, it continued to kill the remaining elm population at a rate of 10 percent per year; was most severe in the eastern part of the State. In Wyoming, it was widespread and still a problem in urban areas, especially around Casper and Wheatland. In Colorado, it was a significant problem in cities that have no active Dutch elm disease management program.
Oak wilt *Ceratocystis fagacearum*	Oak species	Kansas, Nebraska	In Kansas, this disease is spreading slowly eastward (50 acres of newly infected stands were reported). In Nebraska, the disease was reported in the southern and eastern counties near the Missouri River, but the incidence or spread did not seem to be increasing.
Pine wood nematode *Bursaphelenchus xylophilus*	Scots pine	Kansas, Nebraska	In Kansas, damage was limited to two counties along the eastern border (50 acres were affected). In Nebraska, no new occurrences have been noted since 1989.
Abiotic Damage			
Chemical damage	Many hardwood species	Colorado, Kansas, Nebraska, South Dakota, Wyoming	In South Dakota and Wyoming, herbicide damage was the most commonly reported tree disorder. In Colorado, this has been a continuing problem. In Kansas, however, incidence of herbicide damage was much less pronounced than in previous years.

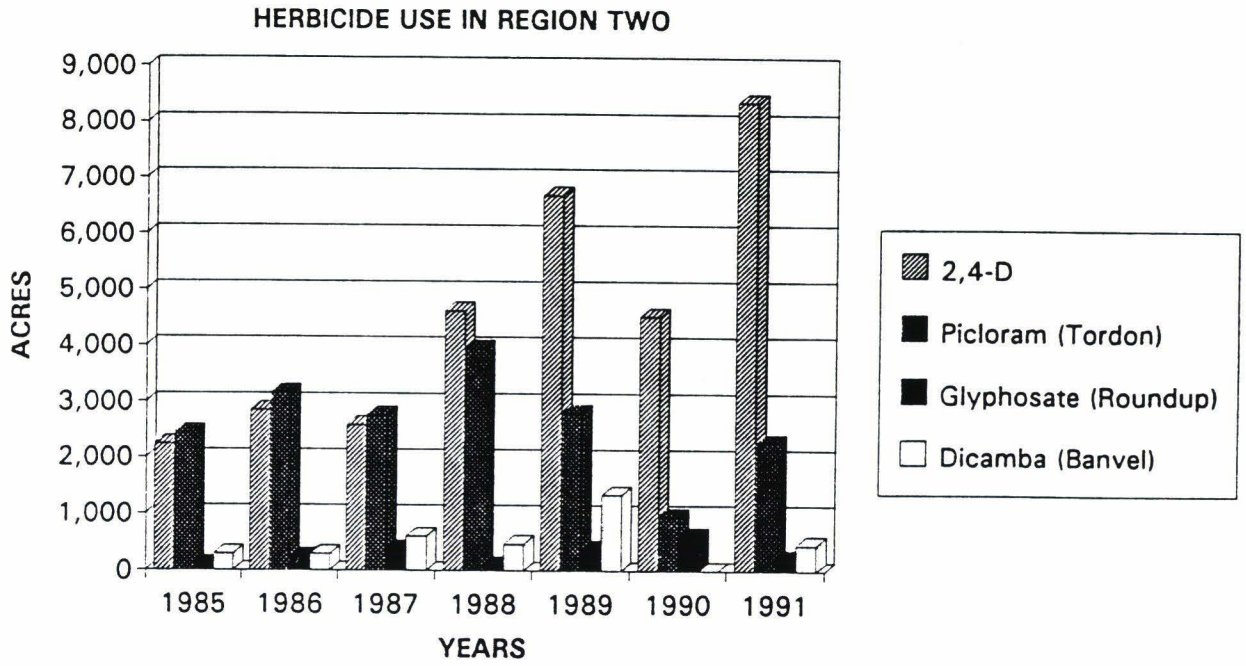
Rocky Mountain Region--Status of diseases in Colorado, Kansas, Nebraska, South Dakota, and central and eastern Wyoming.

Disease	Host	Location	Remarks
Drought, other unknown agents	Black walnut, Blue spruce, Buffaloberry, Dogwood, Green ash, Pear, Ponderosa pine, Poplar, Russian olive, Siberian elm, Silver maple	Colorado, Nebraska, South Dakota, Wyoming,	Generally, long-term and secondary effects of previous dry years are appearing in trees. The increased incidence of some stress-related diseases, like Cytospora canker in Wyoming and Siberian elm canker, is probably related to preceding drought conditions.
Frost damage	Hardwoods	South Dakota	New buds of trees in the northeast corner of South Dakota suffered from frost damage. Trees recovered by midsummer. Bur oak was most severely affected.
High water damage	Ponderosa pine	Colorado	No significant activity was reported in 1991.
Winter drying injury	Lodgepole pine	Wyoming	Extensive damage occurred in areas of the Bighorn National Forest in Wyoming.
Other Damage			
Porcupine feeding	Lodgepole pine, Ponderosa pine	Colorado, South Dakota	Reported heavy in the Black Hills National Forest. In Wyoming, damage was observed in association with white pine blister rust.
Sprout dieback	Aspen	Colorado	Regeneration failure and dieback occurred on the Grand Mesa, Uncompahgre, Gunnison, San Juan, and Routt National Forests.
Squirrel damage	Hackberry, Honeylocust, Maples, Ponderosa pine, Russian olive, Siberian elm	South Dakota	Reported heavy throughout the state. Trees up to six inches in diameter had bark stripped from branches and boles.

Rocky Mountain Region--Status of diseases in Colorado, Kansas, Nebraska, South Dakota, and central and eastern Wyoming.

PESTICIDE USE MANAGEMENT

The use of pesticides continues as an important part of integrated pest management. Pesticides are valuable tools in management of noxious weeds and undesirable vegetation in range management and in forest tree nursery management. Nearly 20,000 acres were treated with pesticides in Region 2 in 1991. The following graph shows herbicide use trends for the past seven years. The major target species in the graph are the sagebrushes, thistles, leafy spurge, and various broadleaf weeds for range improvement and roadside management projects.



Forest Service pesticide applicators will have an opportunity to be trained and certified through a Federal Pesticide Applicator program provided by the Bureau of Land Management in 1992. With this EPA-approved federal program, Forest Service employees that are certified will be allowed to use restricted use pesticides on all National Forest System Land throughout the Region.

PESTICIDE USE IN REGION 2 IN FY 91 1/

Type of Pesticide	Chemical Used	Target Pest	Units Treated 2/
Fumigant	Methyl bromide/ Chloropicrin	Nematodes and Fusarium in nursery beds	11
Fungicide	Benomyl	Phomopsis canker/Scleroderris	80
	Zineb	Lophodermium/Scleroderris	5
Herbicide	Dicamba	Noxious weed control	459
	Diuron/Bromacil	Rights of way/General weed control	16
	Glyphosate	General weed control	217
	Picloram	Noxious weed control	2,279
	Tebuthiuron	Range/wildlife habitat improvement	1084
	2, 4-D	Noxious weed/Range improvement	2070
	2, 4-D/Dicamba	Noxious weed/Range improvement	692
	2, 4-D/Picloram	Noxious weed control	5,609
Insecticide	Carbaryl	Mountain pine beetle	20
	Coumaphos	Lice, mites, ticks	15,200 head of cattle
	Dimethoate	Tip moths	8
Rodenticide	Aluminum phosphide	Prairie dogs	24
	Zinc phosphide	Prairie dogs	7,195

1/ Includes use by the USDA Forest Service, other federal agencies, permittees, licensees, and grantees.

2/ Units are in acres unless otherwise indicated.

CERTIFIED APPLICATORS REPORT

USDA FOREST SERVICE FEDERAL CERTIFIED APPLICATOR REPORT (REFS. FSM 2150 AND FSH 2109.11) (INSTRUCTIONS ON REVERSE SIDE) (REPORT FS-2100-L)			ADMINISTRATIVE UNIT NATIONAL FOREST LANDS REGION 2 FY 1991	DATE 5/6/92
CATEGORY	(1) TOTAL NUMBER CERTIFIED LAST REPORT	(2) NUMBER CERTIFIED THIS FY	(3) REVOKED/ SUSPENDED CERTIFICATIONS THIS FY	(4) TOTAL CERTIFIED END OF THIS FY
(4) AGRICULTURAL				
(5) FOREST	2	1	0	2
(6) ORNAMENTAL AND TURF				
(7) SEED TREATMENT				
(8) AQUATIC				
(9) RIGHT-OF-WAY	1	1		1
(10) INDUSTRIAL				
(11) RESEARCH				
(12) NUMBER OF EMPLOYEES CERTIFIED	2	1		2
PREVIOUS EDITION IS OBSOLETE				FS-2100-4 (9/84)

* Most FS employees were certified through State and EPA programs as private applicators. Region 2 does not have a federal certification program.

Some applicators were certified in more than one category.

Some applicators were temporary employees and are not working at this time.

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